

# Semantic Web

Workshop @ Elpub 2011

Ana Alice Baptista - University of Minho, Portugal

Silvana Gregório Vidotti - UNESP, Brazil





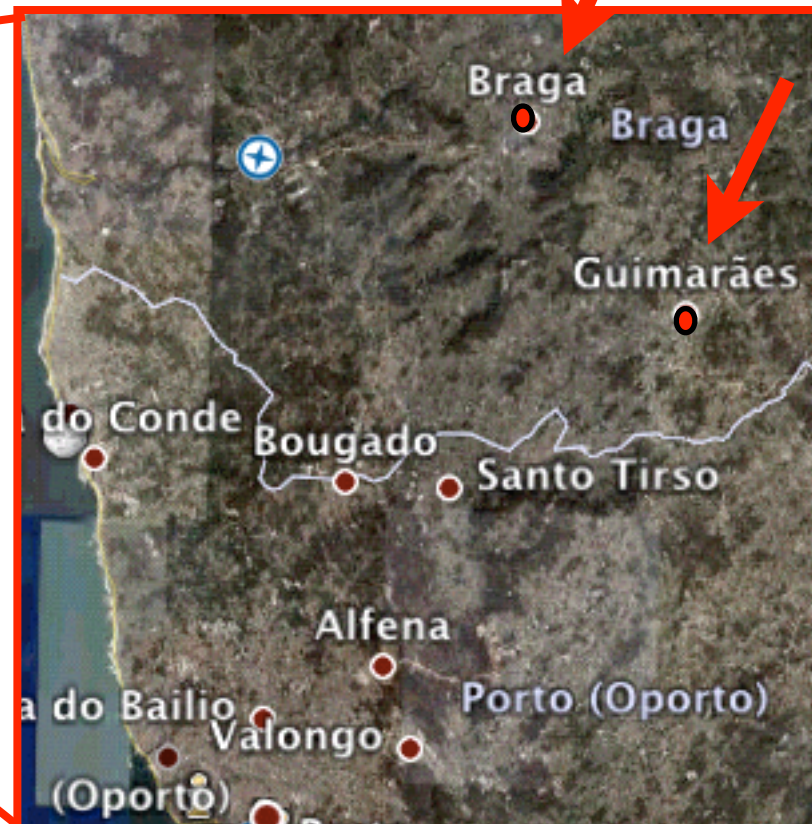
<http://www.dsi.uminho.pt/~analice>  
[analice@dsi.uminho.pt](mailto:analice@dsi.uminho.pt)

- Professor at the Information Systems Department - University of Minho (Portugal);
- Member of the DCMI Advisory Board;
- Chair of the Odisseia Research Group at the University of Minho (Semantic Web, Scholarly Communication and Digital Libraries).











# Universidade do Minho

[www.uminho.pt](http://www.uminho.pt)



- Since 1974
- 2 campi
- 11 schools / institutes
- 30 research centers
- 45 undergrad programs
- 116 MSc programs
- 39 PhD programs
- 15.475 students (except PhD)

- ▶ Arts and Architecture
- ▶ Music
- ▶ Education
- ▶ Law
- ▶ Humanities
- ▶ Psychology
- ▶ Economics and Management
- ▶ Social Sciences
- ▶ Natural Sciences
- ▶ Health Sciences
- ▶ Engineering



<http://www.dsi.uminho.pt/~analice>  
[vidotti@marilia.unesp.br](mailto:vidotti@marilia.unesp.br)

- Professor at the Information Science Department - UNESP (Brazil);
- Chair of the Research Group on New Technologies on Information;
- Vice-President of the Brazilian National Association of Research and Post-Graduation on Information Science.







SOME RIGHTS RESERVED

<http://creativecommons.org/licenses/by-nc-sa/2.5>





# Universidade Estadual Paulista (UNESP)

[www.unesp.br](http://www.unesp.br)

- Since 1976
- 23 towns;
- 32 faculties / institutes
- 169 Undergrad Programs
- 114 MSc Programs
- 91 PhD Programs
- 35.284 Undergrad Students
- 12.633 Grad Students
- 3.316 Teachers



# About the workshop





# Contents



- Part I: Guided tour and examples;
- Part II: Basic Principles and Theory.



Berners-Lee, T., Hendler, J., & Lassila, O. (2001, May). The Semantic Web: A new form of Web content that is meaningful to computers will unleash a revolution of new possibilities. *Scientific American*.

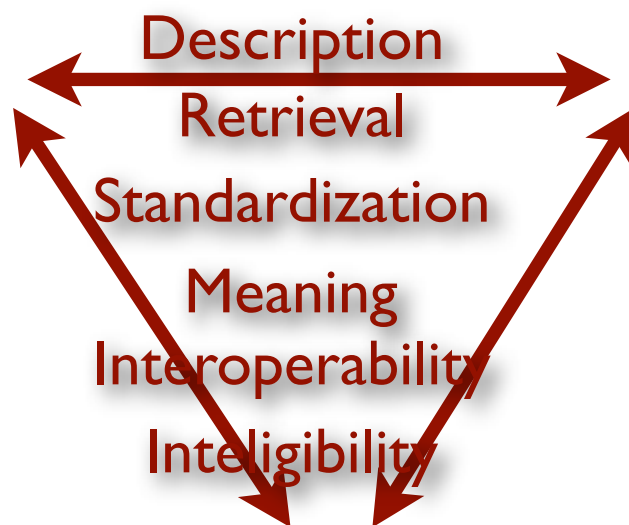




Description  
Retrieval  
Standardization  
Meaning  
Interoperability  
Inteligibility



My  
Calendar



My sisters'  
calendar

Doctor's  
calendar



SOME RIGHTS RESERVED

<http://creativecommons.org/licenses/by-nc-sa/2.5>



Information about Data in a machine-readable way - **Schemas**



Information about Resources / Things in a machine-readable way - **Data**



Resources / **Things**

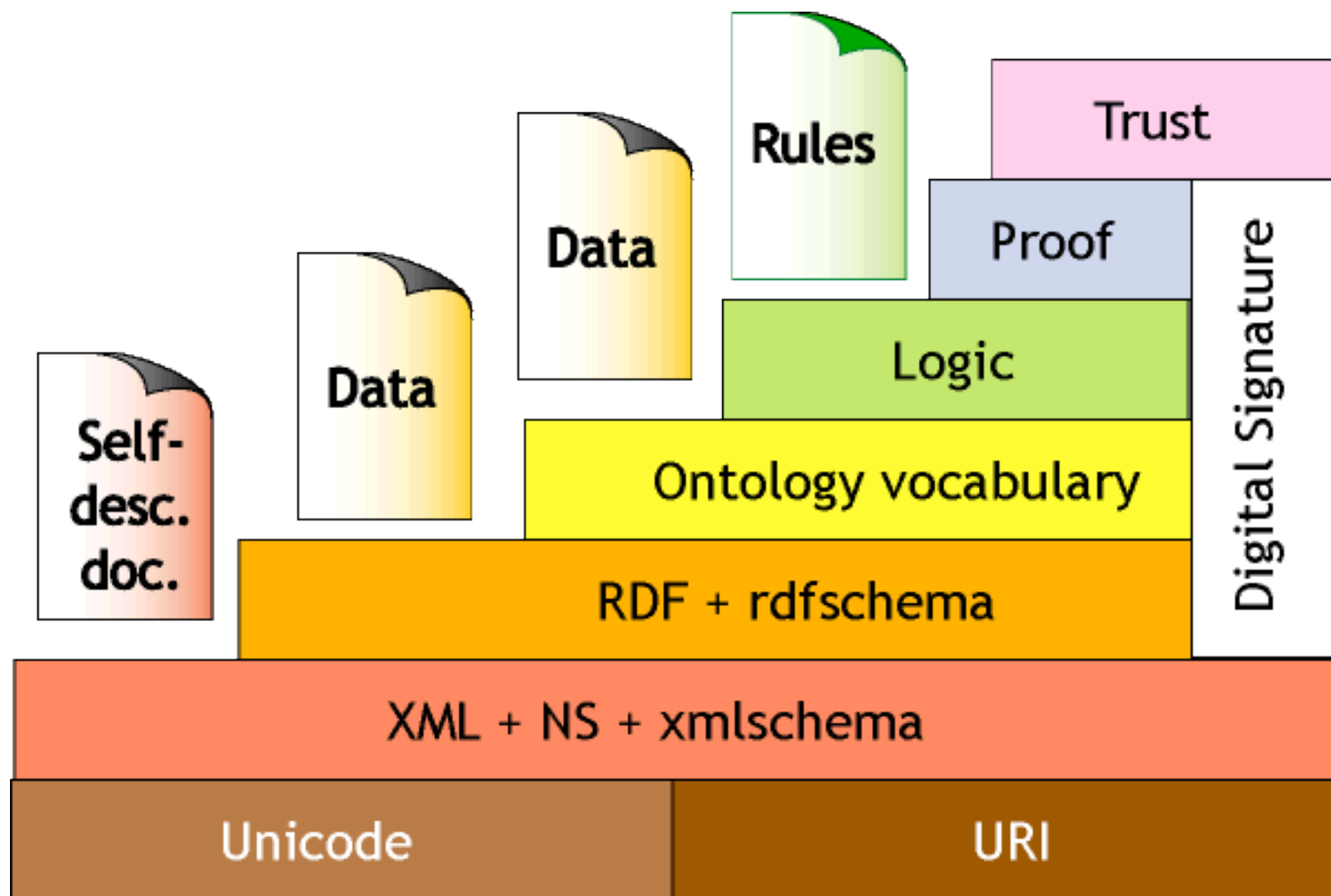
Linked  
Data

# Semantic Web: Data

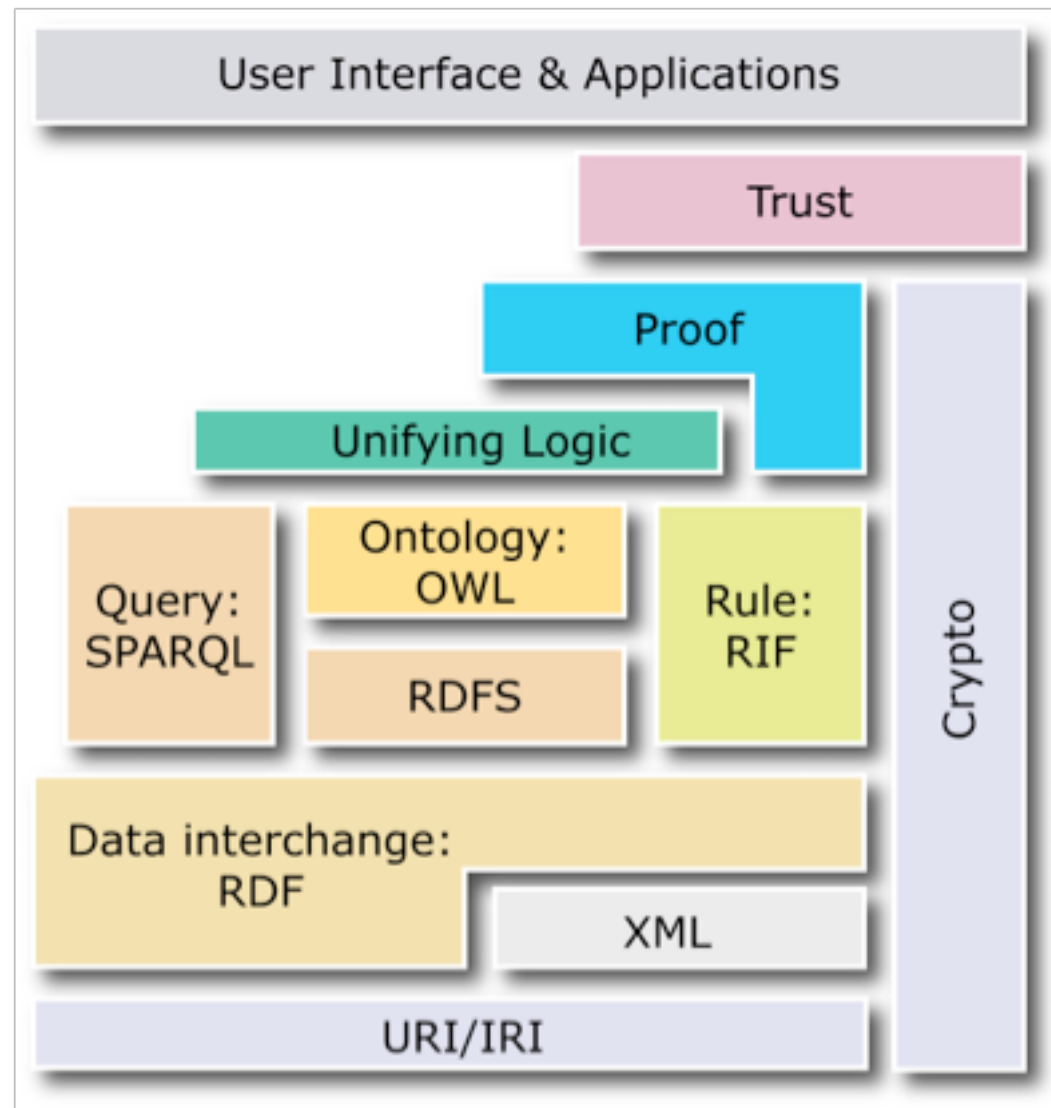


SOME RIGHTS RESERVED

<http://creativecommons.org/licenses/by-nc-sa/2.5>

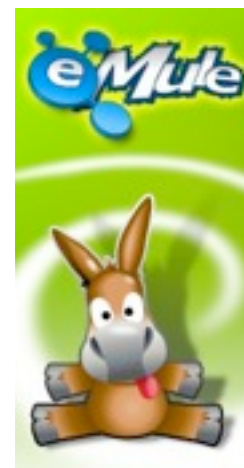








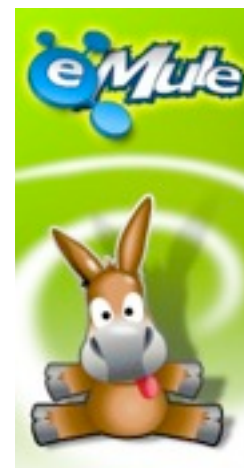
<http://creativecommons.org/licenses/by-nc-sa/2.5>





references  
isReferencedBy  
location  
authorLocation  
subject  
type  
dateIssued  
dateModified

...







Description

Retrieval

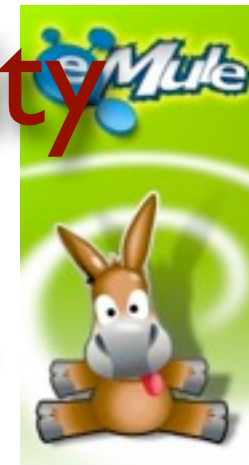
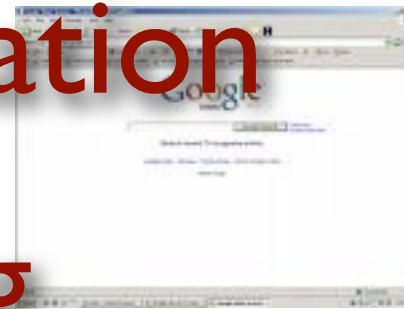
Standardization

Meaning

Interoperability

Inteligibility

references  
isReferencedBy  
location  
authorLocation  
subject  
type  
dateIssued  
dateModified  
...





- Expressing meaning;
- Knowledge Representation;
- Ontologies;
- Agents ;
- Evolution of knowledge.



Retrieval

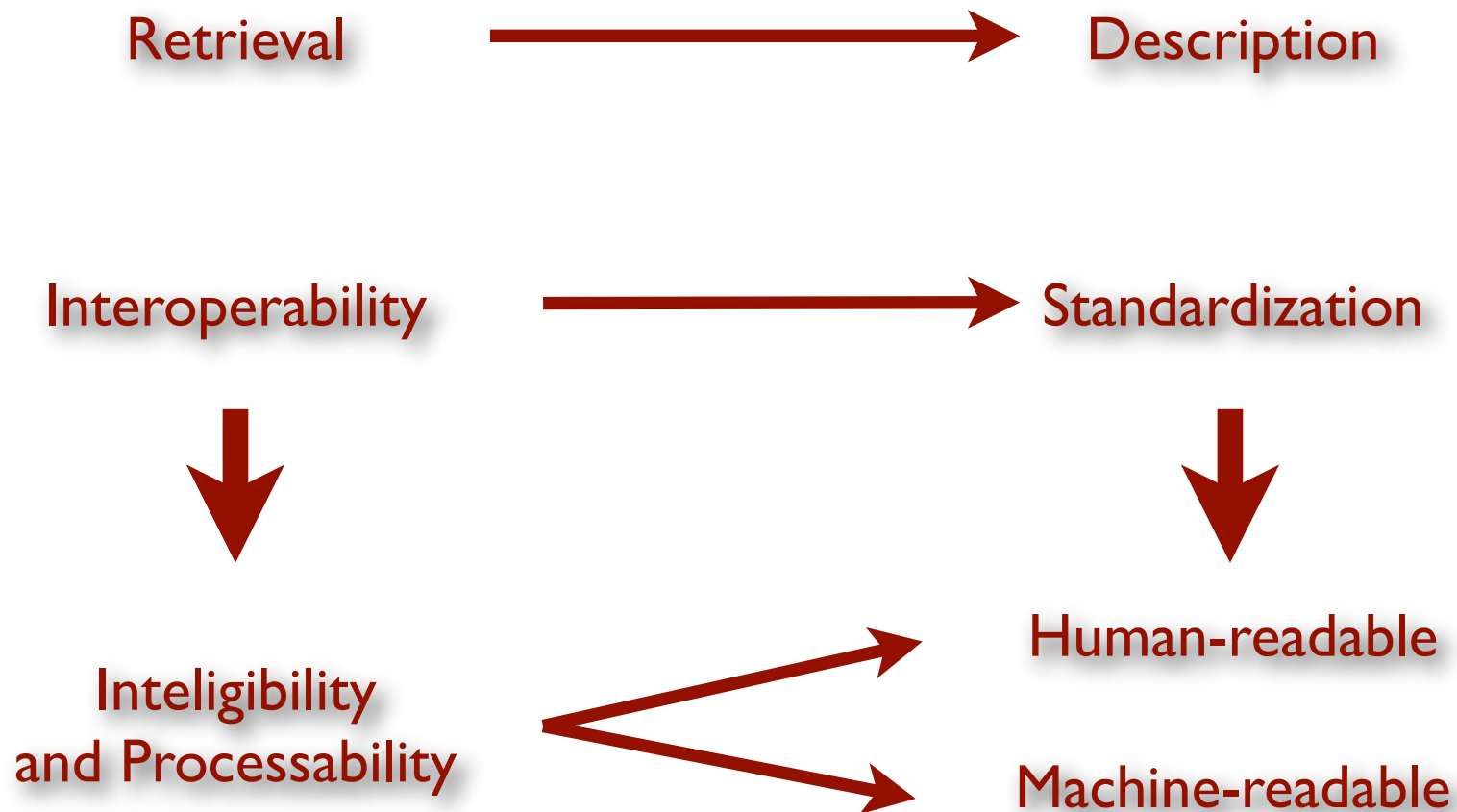


Description

Interoperability



Standardization







<http://www.wolframalpha.com/>



Try:

- Where is Istanbul?
- What time is it in Istanbul?
- What's the distance from Istanbul to Ankara?
- What's the nearest sea to Istanbul?
- Who is the Prime Minister of Turkey?
- What's the chemical formula for salt?
- 22 June



Q: What's happening here?



<http://creativecommons.org/licenses/by-nc-sa/2.5>



## Try some examples



<http://creativecommons.org/licenses/by-nc-sa/2.5>





WIKIPEDIA  
The Free Encyclopedia

Main page  
Contents  
Featured content  
Current events  
Random article  
Donate to Wikipedia

Interaction  
Help  
About Wikipedia  
Community portal  
Recent changes  
Contact Wikipedia

Toolbox  
Print/export

Languages  
Acèh  
Afrikaans  
Alemannisch  
Ænglisc

العربية  
اڤلانيس

Албански  
Alemannisch

Article Discussion

Read Edit View history

Search



# Istanbul

From Wikipedia, the free encyclopedia

Coordinates: 41.01224°N 28.976018°E

**Istanbul** (*Turkish: İstanbul*), historically known as **Byzantium** and **Constantinople**<sup>[2]</sup> (see the **names of Istanbul** for further information) is the largest city in **Turkey** with a population of 13.1 million, which is 17.8% of Turkey's population.<sup>[3]</sup> Istanbul is also a **megacity**, as well as the cultural, economic, and financial centre of **Turkey**. The city covers 39 districts of the **Istanbul province**.<sup>[4]</sup> It is located on the **Bosphorus** Strait and encompasses the natural harbour known as the **Golden Horn**, in the northwest of the country. It extends both on the European (**Thrace**) and on the Asian (**Anatolia**) sides of the **Bosphorus**, and is thereby the only metropolis in the world that is situated on two **continents**. Istanbul is a designated **alpha world city**.

During its long history, Istanbul has served as the capital of the **Roman Empire** (330–395), the **Eastern Roman (Byzantine) Empire** (395–1304 and 1361–1453) the **1st Ottoman Empire** (1299–1517) the **Eastern Roman (Byzantine) Empire** the capital of the **Roman Empire** (330–395)

During its long history, Istanbul has served as

## Istanbul



Top: Topkapı Palace – Hagia Sophia – Blue Mosque  
Center: Beyoğlu; Galata Tower; Maiden's Tower

Bottom: Bosphorus Bridge connecting Europe and Asia, with the skyline of Levent financial district.

Bottom: Bosphorus Bridge connecting Europe and Asia, with the skyline of Levent financial district.

Top: Topkapı Palace – Hagia Sophia – Blue Mosque  
Center: Beyoğlu; Galata Tower; Maiden's Tower



<http://creativecommons.org/licenses/by-nc-sa/2.5>



Logo



Location in Turkey

Coordinates:  41°01'N 28°58'E

Country	 Turkey
Region	Marmara
Province	Istanbul
Established	
- Byzantium	c. 660 BC <sup>[note 1]</sup>
- Constantinople	330 AD
- Istanbul	1453 (Ottoman Turkish) 1923 (Modern Turkish) 1930 (internationally)
Districts	39
Government	
- Mayor	Kadir Topbaş (AKP)
Area	
- Metro <sup>[note 2]</sup>	5,343 km <sup>2</sup> (2,062.9 sq mi)
Population (2010-12-31) <sup>[1]</sup>	
- Urban	13,255,685 (1st Turkish) and (20th World)
- Urban density	2,481/km <sup>2</sup> (6,425.8/sq mi)
Time zone	EET (UTC+2)
- Summer (DST)	EEST (UTC+3)
Postal code	34000 to 34850
Area code(s)	(+90) 212 (European side) (+90) 216 (Asian side)



SOME RIGHTS RESERVED

<http://creativecommons.org/licenses/by-nc-sa/2.5>



**DBpedia**

[DBpedia Blog](#) | [Get Involved](#) | [Get Help](#)

## Try some examples

## Try Faceted Search

## About / News

## Applications

## Use Cases

## Datasets

### Online Access

## Downloads

### Online Access

12.5

# Faceted Wikipedia Search

*Faceted Wikipedia Search* allows users to ask complex queries, such as “How many kilometers?” or “Which Skyscrapers in China have more than 50 floors?” Wikipedia. The answers to these queries are not generated using traditional search engines like Google or Yahoo, but are generated based on structured information that is available on Wikipedia. Wikipedia Search thus allows you to query Wikipedia like a structured knowledge base or intelligence.

!nfe|||ence'



<http://creativecommons.org/licenses/by-nc-sa/2.5>



# All pages (OntologyClass namespace)

All pages

Display pages starting at:

Display pages ending at:

Namespace: OntologyClass



Go

[AcademicJournal](#)[AdministrativeRegion](#)[Airline](#)[Ambassador](#)[AmericanFootballTeam](#)[Animal](#)[Architect](#)[Artery](#)[Athlete](#)[AutoRacingLeague](#)[Award](#)[Band](#)[BasketballLeague](#)[Beverage](#)[Bird](#)[Book](#)[BoxingLeague](#)[BritishRoyalty](#)[Building](#)[CanadianFootballTeam](#)[Cave](#)[ChemicalCompound](#)[Cleric](#)[CollegeCoach](#)[Activity](#)[AdultActor](#)[Airport](#)[AmericanFootballLeague](#)[Amphibian](#)[Arachnid](#)[ArchitecturalStructure](#)[Artist](#)[Atoll](#)[Automobile](#)[Bacteria](#)[BaseballLeague](#)[BasketballPlayer](#)[Bibo:Book](#)[BodyOfWater](#)[BowlingLeague](#)[Brain](#)[BroadcastNetwork](#)[CanadianFootballLeague](#)[Canal](#)[Celebrity](#)[ChristianBishop](#)[ClubMoss](#)[Colour](#)[Actor](#)[Aircraft](#)[Album](#)[AmericanFootballPlayer](#)[AnatomicalStructure](#)[Archaea](#)[Arena](#)[Astronaut](#)[AustralianFootballLeague](#)[AutomobileEngine](#)[BadmintonPlayer](#)[BaseballPlayer](#)[BasketballTeam](#)[BiologicalDatabase](#)[Bone](#)[Boxer](#)[Bridge](#)[Broadcaster](#)[CanadianFootballPlayer](#)[Cardinal](#)[Chancellor](#)[City](#)[College](#)[Comedian](#)



[http://www.europeana.eu/portal/thoughtlab\\_linkedopendata.html](http://www.europeana.eu/portal/thoughtlab_linkedopendata.html)



[My Europeana](#)

[About us](#)

[Communities](#)

## ThoughtLab: Think With Us

### Linked Open Data

**Amsterdam Museum Linked Open Data** - The [Linked Open Data cloud](#) connects items from various domains, including the cultural heritage one. By using unique web-identifiers (URI's) for objects and a common data to describe them (RDF), and by linking to existing resources, a web of semantically linked data emerges.

Europeana's rich semantic data is also added to this Linked Open Data cloud. We use the Europeana Data Model to describe the rich resources from museums, libraries, archives and audiovisual archives, and then link this data to existing datasets such as [DBpedia](#) (a data version of Wikipedia) or [Geonames](#) (structured geographical data).

Currently, the complete Amsterdam Museum's collection is available as Europeana Linked Open Data. As a result, there are now more than 5

Europeana Linked Open Data. As a result, there are now more than 2

Currently, the complete Amsterdam Museum's collection is available as

#### ThoughtLab:

Digital library catalogue

Digitisation

Enriching metadata

Enriching metadata

Digitisation

Digital library catalogue



SOME RIGHTS RESERVED

<http://creativecommons.org/licenses/by-nc-sa/2.5>

[http://www.bbc.co.uk/ontologies/  
programmes/2009-09-07.shtml](http://www.bbc.co.uk/ontologies/programmes/2009-09-07.shtml)



Text only Help

Search

Ex

## Programmes ontology

This Version 2009-09-07, <http://purl.org/ontology/po/2009-09-07.shtml> (rdf)  
Latest Version <http://purl.org/ontology/po/>  
Previous Version <http://purl.org/ontology/po/2009-04-17.shtml>

Authors of this document [Yves Ra](#)

[Patrick Sinclair](#)

[Nicholas J Humfrey](#)

[Michael Smethurst](#)

Source: <http://www.bbc.co.uk/ontologies/>

[programmes/2009-09-07.shtml](http://www.bbc.co.uk/ontologies/programmes/2009-09-07.shtml)  
Copyright © 2007-2009 the British

@prefix tags: <<http://www.holygoat.co.uk/owl/redwood/0.1/tags/>>.

@prefix skos: <<http://www.w3.org/2004/02/skos/core#>>.

@prefix dcterms: <<http://purl.org/dc/terms/>>.

@prefix frbr: <<http://purl.org/vocab/frbr/core#>>.

@prefix : <<http://purl.org/ontology/po/>>.

<<http://purl.org/ontology/po/>>

owl:Ontology;

rdfs:label "Programmes ontology";

rdfs:comment ""

A vocabulary for [programme](#) data.

It defines concepts such as brands, series, episodes, broadcasts, etc.

"";

dc:creator <<http://moustaki.org/foaf.rdf#moustaki>>;

dc:contributor <<http://www.aelius.com/njh#me>>;

dc:contributor <<http://metade.org/foaf.rdf#me>>;

dc:date "\$Date: 2009/02/20 16:00:00 \$";

owl:imports

<<http://purl.org/NET/c4dm/event.owl>>,

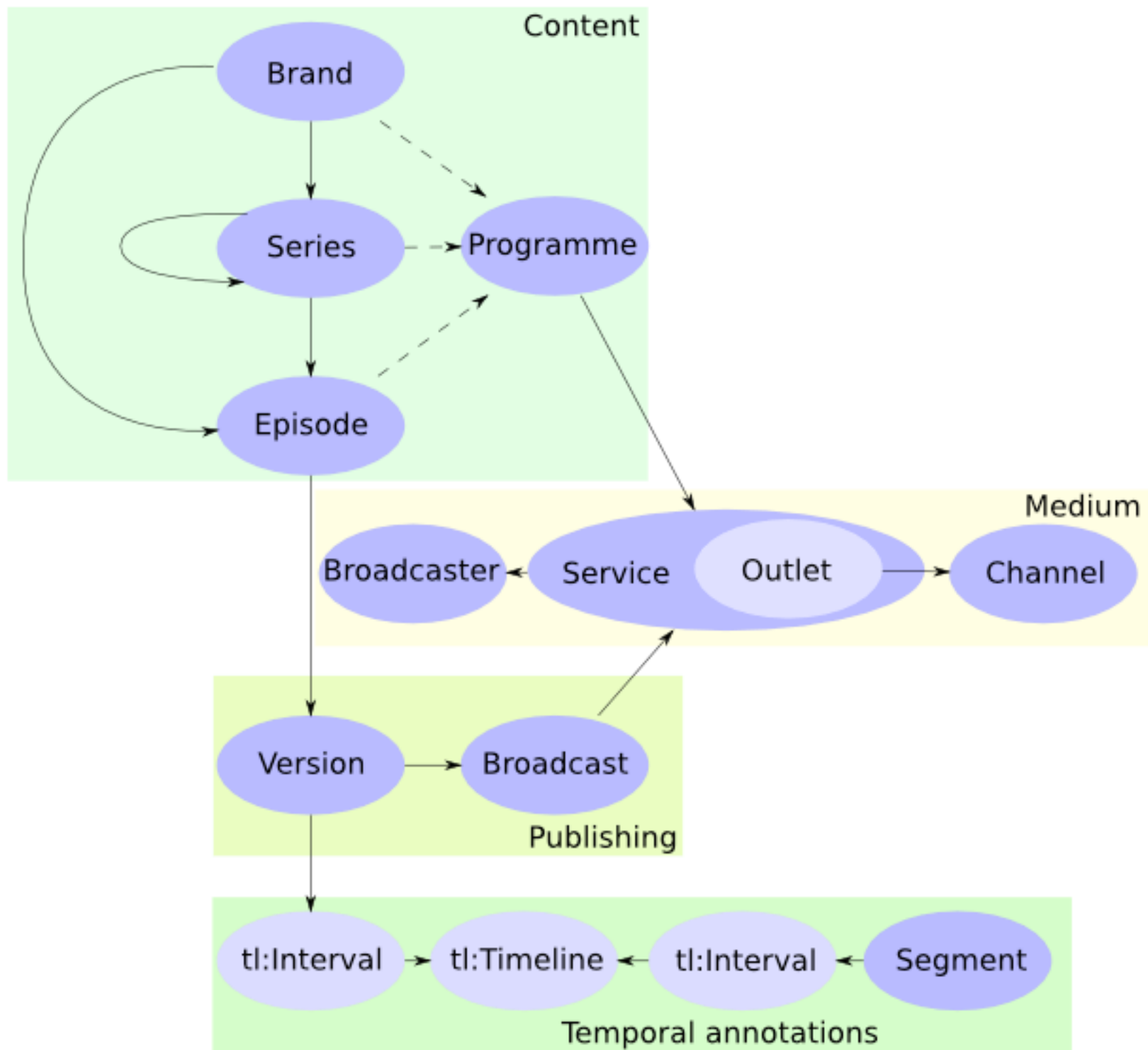
<<http://purl.org/NET/c4dm/timeline.owl>>



SOME RIGHTS RESERVED

<http://creativecommons.org/licenses/by-nc-sa/2.5>

Source: [http://www.bbc.co.uk/go/ontologies/programmes/2009-09-07.shtml/ext/\\_auto/-/http://purl.org/ontology/po/2009-09-07.n3](http://www.bbc.co.uk/go/ontologies/programmes/2009-09-07.shtml/ext/_auto/-/http://purl.org/ontology/po/2009-09-07.n3)



# [http://dbpedia.org/page/BBC\\_Television](http://dbpedia.org/page/BBC_Television)

## About: [BBC Television](#)

An Entity of Type : [television production companies of the United Kingdom](#), from Named Graph [dbpedia.org](#)

BBC Television is a service of the British Broadcasting Corporation. The corporation, which has operated in the United Kingdom from its own studios since 1932, although the start of its regular service of television broadcasts is dated to 2 November 1936.

Property	Value
<a href="#">dbpedia-owl:abstract</a>	<ul style="list-style-type: none"><li>BBC Television is a service of the British Broadcasting Corporation. The corporation, which has operated in the United Kingdom from its own studios since 1932, although the start of its regular service of television broadcasts is dated to 2 November 1936.</li></ul>
<a href="#">dbpprop:hasPhotoCollection</a>	<ul style="list-style-type: none"><li><a href="http://www4.wiwiss.fu-berlin.de/flickrwrappr/photos/BBC_Television">http://www4.wiwiss.fu-berlin.de/flickrwrappr/photos/BBC_Television</a></li></ul>
<a href="#">dbpprop:id</a>	<ul style="list-style-type: none"><li>tv</li></ul>
<a href="#">dbpprop:title</a>	<ul style="list-style-type: none"><li>BBC TV</li></ul>
<a href="#">dbpprop:wikiPageUsesTemplate</a>	<ul style="list-style-type: none"><li><a href="#">dbpedia:Template:Bbc.co.uk</a></li></ul>
<a href="#">dcterms:subject</a>	<ul style="list-style-type: none"><li><a href="#">category:Peabody_Award_winners</a></li><li><a href="#">category:Commercial-free_television_networks</a></li><li><a href="#">category:Television_production_companies_of_the_United_Kingdom</a></li><li><a href="#">category:BBC_television</a></li></ul>
<a href="#">rdf:type</a>	<ul style="list-style-type: none"><li><a href="#">yago:Commercial-freeTelevisionNetworks</a></li><li><a href="#">yago:TelevisionProductionCompaniesOfTheUnitedKingdom</a></li></ul>



SOME RIGHTS RESERVED

<http://creativecommons.org/licenses/by-nc-sa/2.5>



# <http://dbpedia.org/sparql>

## OpenLink Virtuoso SPARQL Query

This query page is designed to help you test OpenLink Virtuoso SPARQL protocol endpoint.

Consult the [Virtuoso Wiki page](#) describing the service or the [Online Virtuoso Documentation](#) section [RDF Database and SPARQL](#).

There is also a rich Web based user interface with sample queries. You can access it at [http://dbpedia.org/sparql](#).

### Query

#### Default Graph URI

<http://dbpedia.org>

(Security restrictions of this server do not allow you to retrieve remote RDF data. The administrator can change them, according to these [instructions](#).)

#### Query text

```
SELECT ?abstract
FROM NAMED <http://dbpedia.org>
WHERE {
  <http://dbpedia.org/resource/Civil_engineering>
  <http://dbpedia.org/ontology/abstract> ?abstract.
  FILTER langMatches( lang(?abstract), 'en')
}
```

#### abstract

"Civil engineering is a professional engineering discipline that deals with the design, construction, and maintenance of the physical and naturally built environment, including works such as bridges, roads, canals, dams and buildings. Civil engineering is the oldest engineering discipline after military engineering, and it was defined to distinguish non-military engineering from military engineering. It is traditionally broken into several sub-disciplines including environmental engineering, geotechnical engineering, structural engineering, transportation engineering, municipal or urban engineering, water resources engineering, materials engineering, coastal engineering, surveying, and construction engineering. Civil engineering takes place on all levels: in the public sector from municipal through to federal levels, and in the private sector from individual homeowners through to international companies."@en



SOME RIGHTS RESERVED

<http://creativecommons.org/licenses/by-nc-sa/2.5>

# <http://dbpedia.org/sparql>

## OpenLink Virtuoso SPARQL Query

This query page is designed to help you test OpenLink Virtuoso SPARQL protocol endpoint. Consult the [Virtuoso Wiki page](#) describing the service or the [Online Virtuoso Documentation](#) section [RDF Database and SPARQL](#).

There is also a rich Web based user interface with sample queries. You can access it at: [/isparql](#).

### Query

#### Default Graph URI

<http://dbpedia.org>

*(Security restrictions of this server do not allow you to retrieve remote RDF data; administrator can change them, according to these [instructions](#).)*

#### Query text

```
SELECT ?abstract
FROM NAMED <http://dbpedia.org>
WHERE {
  <http://dbpedia.org/resource/Civil_engineering>
  <http://dbpedia.org/ontology/abstract> ?abstract.
  FILTER langMatches( lang(?abstract), 'pt')
}
```

#### abstract

"*Texto em itálico*"[[Ficheiro:FalkirkWheelSide 2004 SeanMcClean. jpg|300px|right|thumb|Exemplo de uma obra de construção civil na Escócia, Reino Unido: o Falkirk Wheel, que é uma obra fluvial para transposição de barcos. ] Engenharia civil é o ramo da engenharia que projecta e executa obras como edifícios, pontes, viadutos, estradas, barragens e outras obras da engenharia hidráulica fluvial e da Hidráulica Marítima, assim como da engenharia sanitária. Os termos Construção civil e Engenharia civil são originados de uma época em que só existiam apenas duas classificações para a Engenharia sendo elas Civil e Militar. A Engenharia militar era destinada apenas aos militares e a Engenharia civil destinada aos demais cidadãos. Com o tempo, a Engenharia civil, que englobava todas as áreas, foi se dividindo, e hoje conhecemos várias divisões, como a elétrica, mecânica,



SOME RIGHTS RESERVED

<http://creativecommons.org/licenses/by-nc-sa/2.5>



*From documents to data and integration*

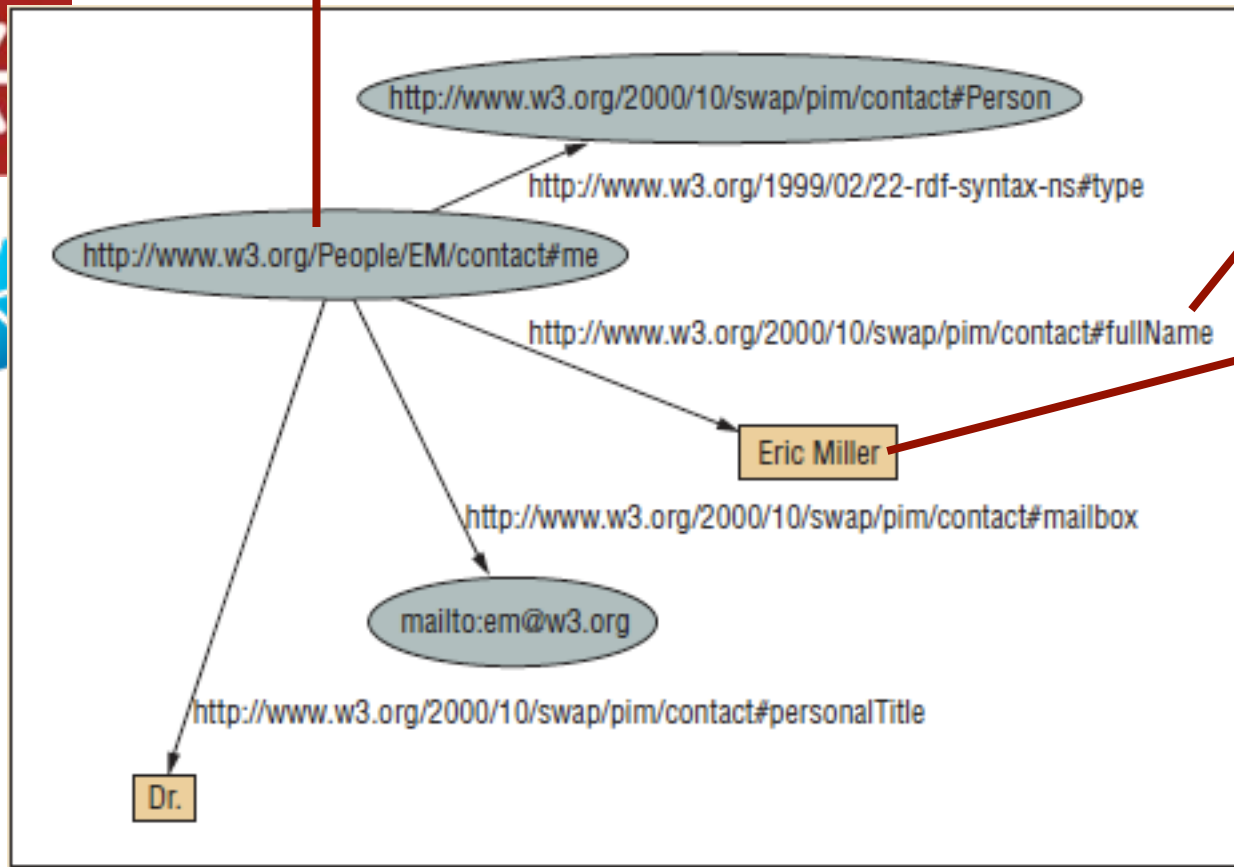
How?



Subject

Predicate

Object

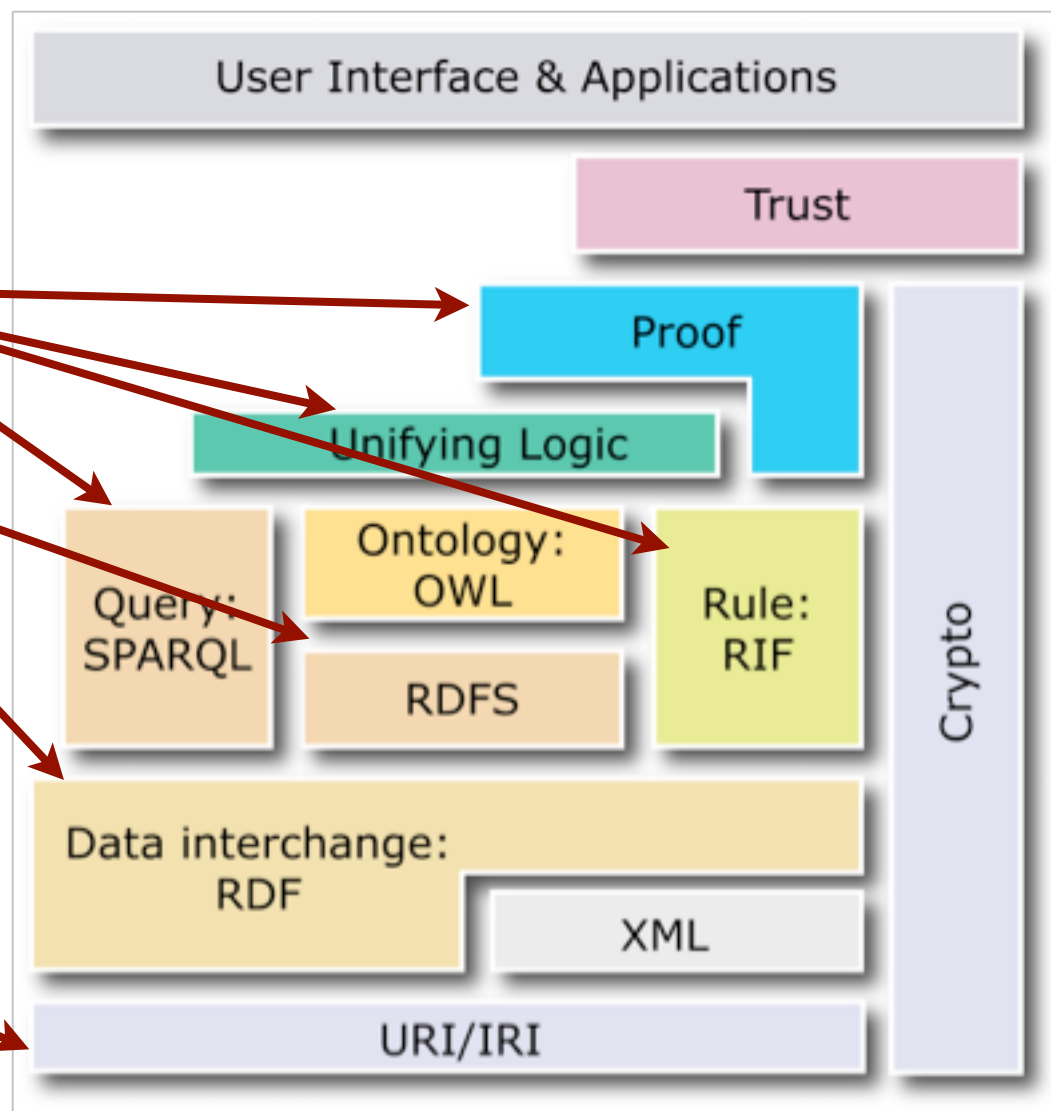


## Resource Description Framework (RDF)





- Rules and Inference;
- Ontologies;
- *Triple Stores* - RDF;
- Mapping to RDF (from HTML, XML...);
- *Universal Resource Identifier* (URI).

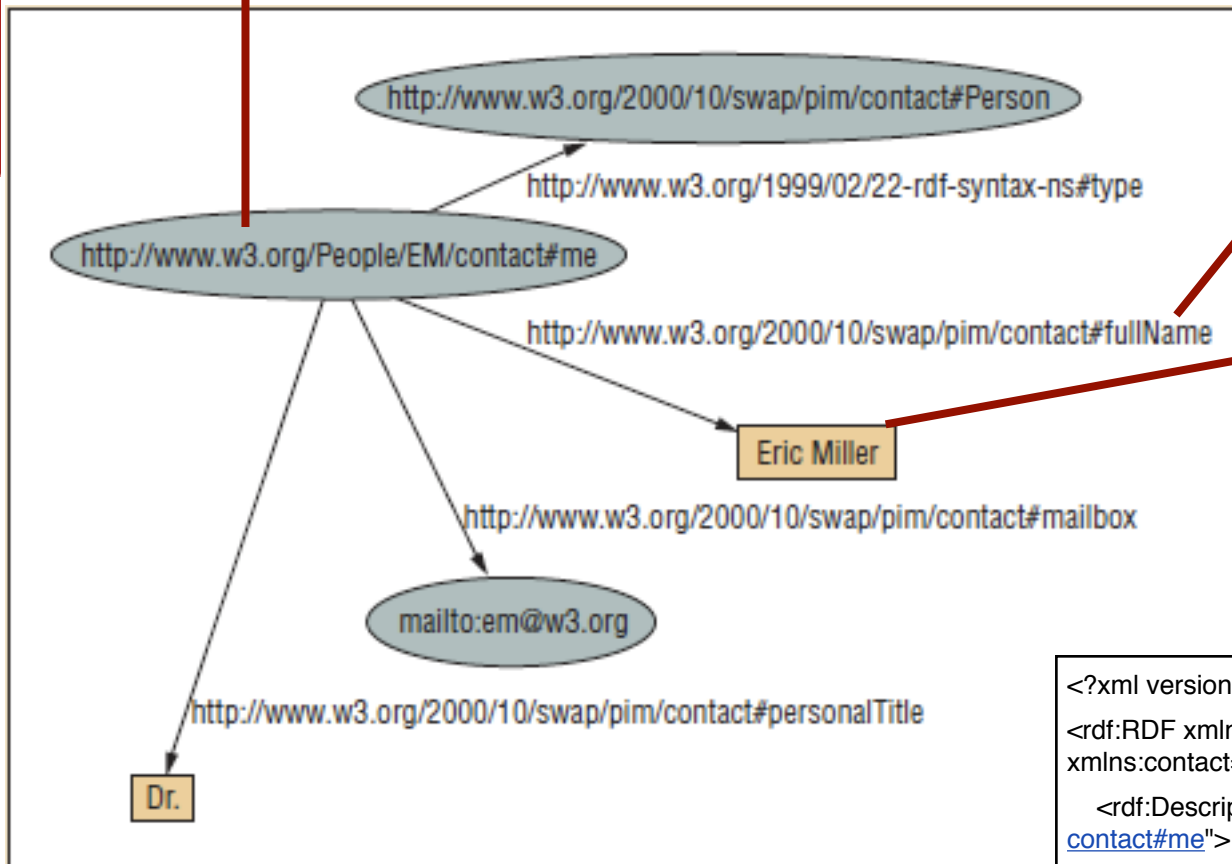




We will  
have a  
look at  
this level



# Subject



Predicate

Object

```
<?xml version="1.0"?>
<rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:contact="http://www.w3.org/2000/10/swap/pim/contact#">
  <rdf:Description rdf:about="http://www.w3.org/2000/10/swap/pim/
    contact#me">
    <rdf:type rdf:resource="http://www.w3.org/2000/10/swap/pim/
      contact#Person"/>
    <contact:fullName>Eric Miller</contact:fullName>
    <contact:mailbox rdf:resource="mailto:em@w3.org"/>
    <contact:personalTitle>Dr.</contact:personalTitle>
  </rdf:Description>
</rdf:RDF>
```

## Resource Description Framework (RDF)





Let's listen:



Tim Berners-Lee on the next Web. (2009).TED Talks.

[http://www.ted.com/talks/tim\\_berners\\_lee\\_on\\_the\\_next\\_web.html](http://www.ted.com/talks/tim_berners_lee_on_the_next_web.html)



<http://creativecommons.org/licenses/by-nc-sa/2.5>





# Question



To what data is Tim Berners-Lee referring to?

1. Join in groups of three;
2. Find out who lives furthest away -> speaker;
3. Answer the question in two minutes.





“The Semantic Web provides a **common framework** that allows data to be shared and reused **across** application, enterprise, and community **boundaries**. It is a collaborative effort led by W3C with participation from a large number of researchers and industrial partners. It is based on the **Resource Description Framework**”.

(W3C SWA, 18/06/2011)





# Data



# What do you mean by data?

- Web pages, Web services, and everything that is identifiable
  - Dublin Core Metadata Initiative (DCMI) and the World Wide Web Consortium (W3C) call them **resources** or **subjects**;
- Attributes of these resources, the relationships with other resources that they support
  - DCMI calls them **elements** or properties; W3C calls them **properties** or **predicates**;
- The values that are related with the attributes / properties
  - DCMI calls them values and W3C calls them **values** or **objects**.

# Examples of Resources



Broadcast Yourself™

Home

Videos

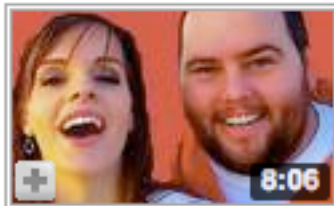
Cl

Início

Minhas coisas

## Spotlight: Valentine's Day

Naturally, we all love YouTube, but for these couples either met through the site or they use their channel



### OUR LOVE STORY!

23 hours ago  
208,024 views



shavcarl



### Surprise Marriage Proposal

4 months ago  
1,018,048 views



CTFxC



do YAHOO!



WolframAlpha<sup>™</sup> computational knowledge engine

## Making the World's Knowledge Computable

Today's Wolfram|Alpha is the first step in an

Web Images Videos Shopping News Maps More

bing

Show all Only from United Kingdom

computing... More about Wolfram|Alpha »

Stephen Wolfram's intro

One-page summary

Sample input

7/8 × 72 m

8:25 am to 7:

minimize (4-)

Examples

# D-Lib<sup>®</sup> Magazine

The Magazine of Digital Library Research

HOME | ABOUT D-LIB | CURRENT ISSUE | ARCHIVE | INDEXES | CAL

D-LIB MAGAZINE

doi:10.1045/dlib.magazine | ISSN:1082-9873



SOME RIGHTS RESERVED

<http://creativecommons.org/licenses/by-nc-sa/2.5>



# Examples of Properties



- Of a scientific article: author, title, title of the journal, volume, issue, publishing date,...;
- Of a video: title, director, producer, length, size (Bytes? KB?...),...;
- For an image - title, author, resolution, size,...;



# Examples of Objects



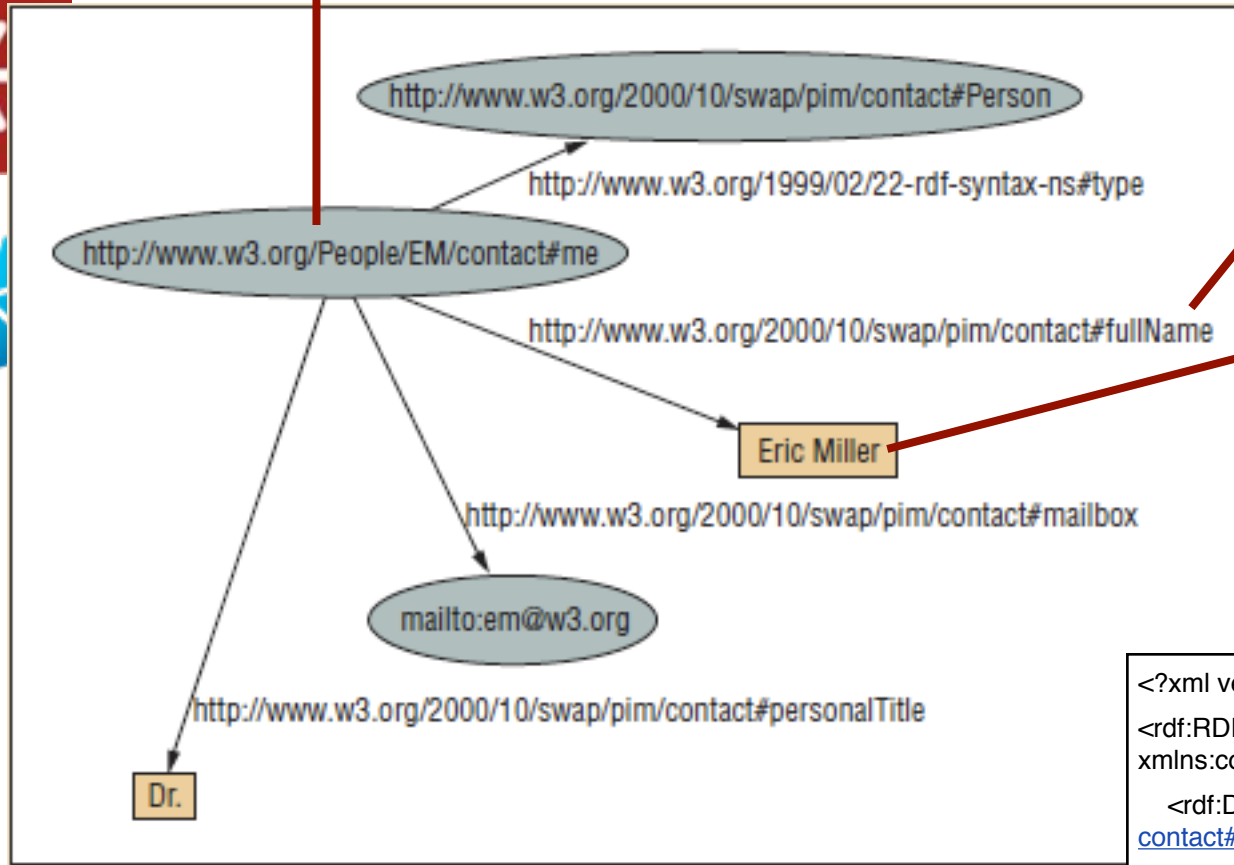
- “Tim Berners-Lee”
- “16/02/2010”
- “JPEG”
- “Semantic Web”
- <http://dublincore.org>

This object may be  
the subject of a  
new statement

# Subject

# Predicate

# Object




```
<?xml version="1.0"?>
<rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:contact="http://www.w3.org/2000/10/swap/pim/contact#">
  <rdf:Description rdf:about="http://www.w3.org/2000/10/swap/pim/
    contact#me">
    <rdf:type rdf:resource="http://www.w3.org/2000/10/swap/pim/
      contact#Person"/>
    <contact:fullName>Eric Miller</contact:fullName>
    <contact:mailbox rdf:resource="mailto:em@w3.org"/>
    <contact:personalTitle>Dr.</contact:personalTitle>
  </rdf:Description>
</rdf:RDF>
```

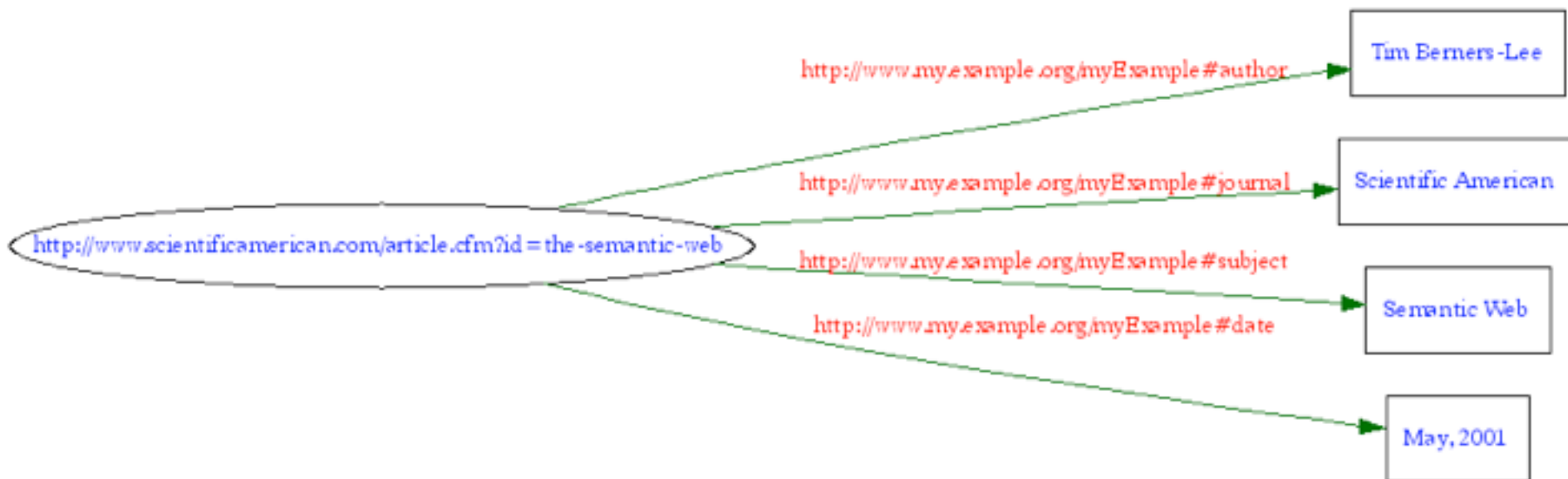
## Resource Description Framework (RDF)



I can to do the following statements:

- 
- "The author of the article referred by <http://www.scientificamerican.com/article.cfm?id=the-semantic-web> is Tim Berners-Lee; the subject of the article is the Semantic Web; the article was published in May 2001 on Scientific American"
  - “The author of the article referred by <http://www.scientificamerican.com/article.cfm?id=the-semantic-web> is Tim Berners-Lee and his email is [timbl@w3.org](mailto:timbl@w3.org)”





RDF parsed at the W3C RDF Validation Service at <http://www.w3.org/RDF/Validator/>



SOME RIGHTS RESERVED

<http://creativecommons.org/licenses/by-nc-sa/2.5>



RDF parsed at the W3C RDF Validation Service at <http://www.w3.org/RDF/Validator/>



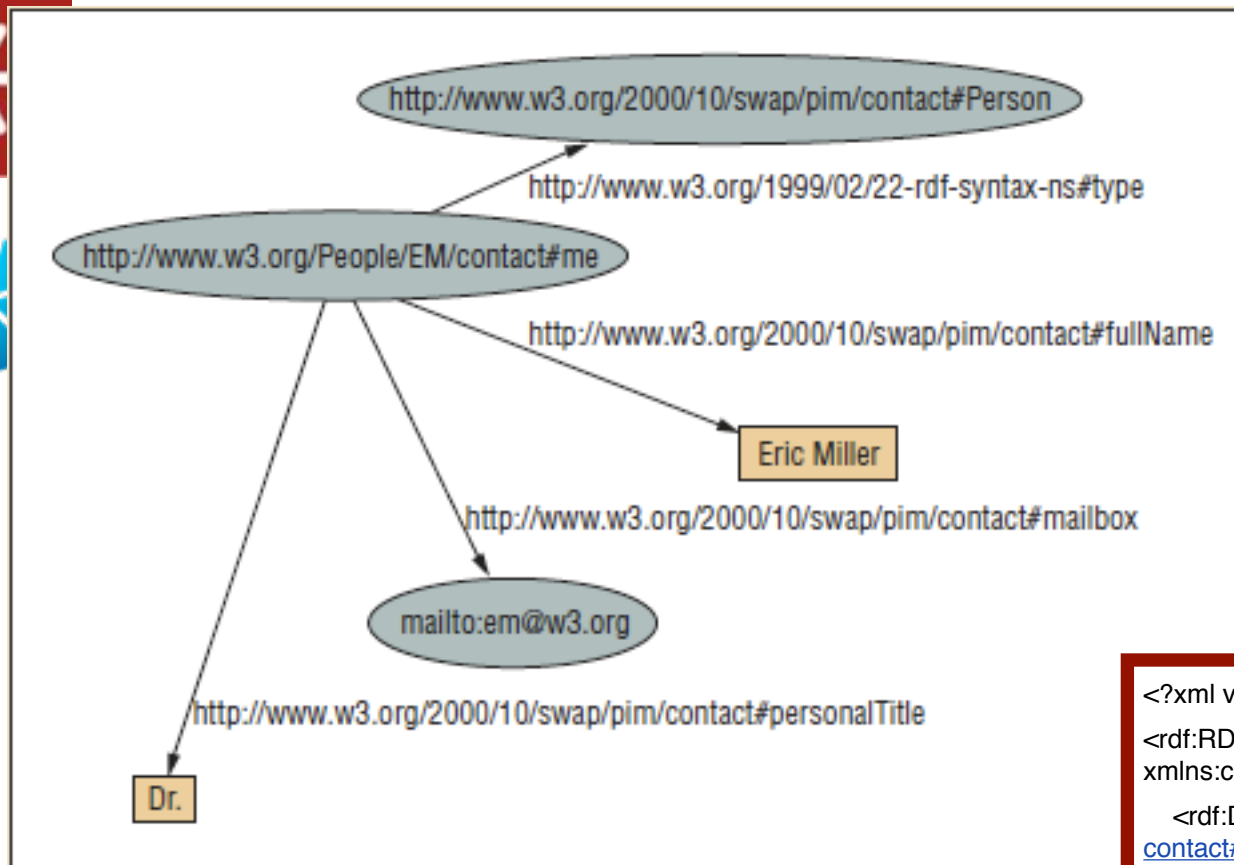


# Inteligibility by Machines





In order to be intelisible by machines, the resources must be described in a language that machines understand (SQL, C#, Java, HTML, XML, RDF,...);



```
<?xml version="1.0"?>
<rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:contact="http://www.w3.org/2000/10/swap/pim/contact#">
  <rdf:Description rdf:about="http://www.w3.org/2000/10/swap/pim/
    contact#me">
    <rdf:type rdf:resource="http://www.w3.org/2000/10/swap/pim/
      contact#Person"/>
    <contact:fullName>Eric Miller</contact:fullName>
    <contact:mailbox rdf:resource="mailto:em@w3.org"/>
    <contact:personalTitle>Dr.</contact:personalTitle>
  </rdf:Description>
</rdf:RDF>
```

# Resource Description Framework (RDF)



"The author of the article referred by <http://www.scientificamerican.com/article.cfm?id=the-semantic-web> is Tim Berners-Lee; the subject of the article is the Semantic Web; the article was published in May 2001 on Scientific American"








```
<?xml version="1.0"?>
```

```
<rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:eg="http://www.my.example.org/myExample#">
```



```
<rdf:Description rdf:about="http://www.scientificamerican.com/article.cfm?id=the-semantic-web">
  <eg:author>Tim Berners-Lee</eg:author>
<eg:journal>Scientific American</eg:journal>
<eg:subject>Semantic Web</eg:subject>
<eg:date>May, 2001</eg:date>
</rdf:Description>
</rdf:RDF>
```

### Triples of the Data Model

Number	Subject	Predicate	Object
1	<a href="http://www.scientificamerican.com/article.cfm?id=the-semantic-web">http://www.scientificamerican.com/article.cfm?id=the-semantic-web</a>	<a href="http://www.my.example.org/myExample#author">http://www.my.example.org/myExample#author</a>	"Tim Berners-Lee"
2	<a href="http://www.scientificamerican.com/article.cfm?id=the-semantic-web">http://www.scientificamerican.com/article.cfm?id=the-semantic-web</a>	<a href="http://www.my.example.org/myExample#journal">http://www.my.example.org/myExample#journal</a>	"Scientific American"
3	<a href="http://www.scientificamerican.com/article.cfm?id=the-semantic-web">http://www.scientificamerican.com/article.cfm?id=the-semantic-web</a>	<a href="http://www.my.example.org/myExample#subject">http://www.my.example.org/myExample#subject</a>	"Semantic Web"
4	<a href="http://www.scientificamerican.com/article.cfm?id=the-semantic-web">http://www.scientificamerican.com/article.cfm?id=the-semantic-web</a>	<a href="http://www.my.example.org/myExample#date">http://www.my.example.org/myExample#date</a>	"May, 2001"





SOME RIGHTS RESERVED

<http://creativecommons.org/licenses/by-nc-sa/2.5>



“The author of the article referred by <http://www.scientificamerican.com/article.cfm?id=the-semantic-web> is Tim Berners-Lee and his email is [timbl@w3.org](mailto:timbl@w3.org)”

```
<?xml version="1.0"?>
<rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:eg="http://www.my.example.org/myExample#">
  <rdf:Description rdf:about="http://www.scientificamerican.com/article.cfm?id=the-semantic-web">
    <eg:author rdf:resource="http://www.w3.org/People/Berners-Lee"/>
  </rdf:Description>

  <rdf:Description rdf:about="http://www.w3.org/People/Berners-Lee/">
    <eg:email>timbl@w3.org"</eg:email>
  </rdf:Description>

</rdf:RDF>
```

## Triples of the Data Model

Number	Subject	Predicate	Object
1	<a href="http://www.scientificamerican.com/article.cfm?id=the-semantic-web">http://www.scientificamerican.com/article.cfm?id=the-semantic-web</a>	<a href="http://www.my.example.org/myExample#author">http://www.my.example.org/myExample#author</a>	<a href="http://www.w3.org/People/Berners-Lee">http://www.w3.org/People/Berners-Lee</a>
2	<a href="http://www.w3.org/People/Berners-Lee/">http://www.w3.org/People/Berners-Lee/</a>	<a href="http://www.my.example.org/myExample#email">http://www.my.example.org/myExample#email</a>	"timbl@w3.org"



# Interoperability





- To be interoperable it is not enough to be intelligible by machines;
- We have to fill all the needed and sufficient conditions to be intelligible for any machine in the Web.



Commitment to Standards



The Semantic Web is about two things:

- **Common formats** for integration and combination of data drawn from diverse sources;
- **A language** for recording how the data relates to real world objects.

(W3C SWA, consultado em 03/01/2007)





- **Common Formats:**
  - Names of the attributes / properties;
  - The values related with those attributes/properties -> encoding schemas (syntax and vocabulary encoding schemas);
- **Encoding language.**



Information about Data in a machine-readable way - **Schemas**



Information about Resources / Things in a machine-readable way - **Data**



Resources / **Things**

Linked  
Data

# Semantic Web: Data



- Standards for the names of the attributes: *Dublin Core Metadata Element Set (DCMES)*, *IEEE Learning Object Metadata (IEEE LOM)*, *Publishing Requirements for Industry Standard Metadata (PRISM)*, *Friend Of A Friend (FOAF)*,...
- Standards for the codification of the values related with the attributes - syntax encoding schemas: *W3CDTF*, *ISO 639-2*,...
- Standards for the codification of the values related with the attributes - vocabulary encoding schemas: *MESH*, *LCSH*,...



# Task



Get together in groups of three and find out what is the purpose of the following standards / recommendations:

DCMES  
DCTERMS  
IEEE LOM  
W3CDTF  
ISO 639-2  
FOAF



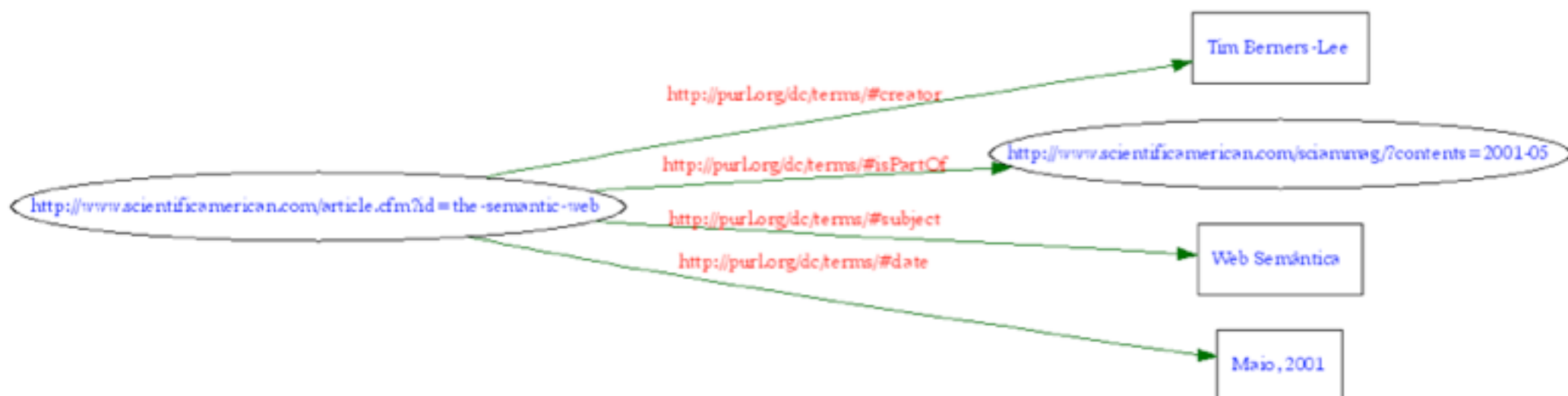


# Do it with DCTerms



"The author of the article referred by <http://www.scientificamerican.com/article.cfm?id=the-semantic-web> is Tim Berners-Lee; the subject of the article is the Semantic Web; the article was published in May 2001 on Scientific American"

## Graph of the data model



## Triples of the Data Model

Number	Subject	Predicate	Object
1	<code>http://www.scientificamerican.com/article.cfm?id=the-semantic-web</code>	<code>http://purl.org/dc/terms/#creator</code>	"Tim Berners-Lee"
2	<code>http://www.scientificamerican.com/article.cfm?id=the-semantic-web</code>	<code>http://purl.org/dc/terms/#isPartOf</code>	<code>http://www.scientificamerican.com/sciammag/?contents=2001-05</code>
3	<code>http://www.scientificamerican.com/article.cfm?id=the-semantic-web</code>	<code>http://purl.org/dc/terms/#subject</code>	"Web Semântica"
4	<code>http://www.scientificamerican.com/article.cfm?id=the-semantic-web</code>	<code>http://purl.org/dc/terms/#date</code>	"Maio, 2001"





# [http://dbpedia.org/page/BBC\\_Television](http://dbpedia.org/page/BBC_Television)

## About: [BBC Television](#)

An Entity of Type : [television production companies of the United Kingdom](#), from Named Graph [dbpedia.org](#)

BBC Television is a service of the British Broadcasting Corporation. The corporation, which has operated in the United Kingdom from its own studios since 1932, although the start of its regular service of television broadcasts is dated to 2 November 1936.

Property	Value
<a href="#">dbpedia-owl:abstract</a>	<ul style="list-style-type: none"><li>BBC Television is a service of the British Broadcasting Corporation. The corporation, which has operated in the United Kingdom from its own studios since 1932, although the start of its regular service of television broadcasts is dated to 2 November 1936.</li></ul>
<a href="#">dbpprop:hasPhotoCollection</a>	<ul style="list-style-type: none"><li><a href="http://www4.wiwiss.fu-berlin.de/flickrwrappr/photos/BBC_Television">http://www4.wiwiss.fu-berlin.de/flickrwrappr/photos/BBC_Television</a></li></ul>
<a href="#">dbpprop:id</a>	<ul style="list-style-type: none"><li>tv</li></ul>
<a href="#">dbpprop:title</a>	<ul style="list-style-type: none"><li>BBC TV</li></ul>
<a href="#">dbpprop:wikiPageUsesTemplate</a>	<ul style="list-style-type: none"><li><a href="#">dbpedia:Template:Bbc.co.uk</a></li></ul>
<a href="#">dcterms:subject</a>	<ul style="list-style-type: none"><li><a href="#">category:Peabody_Award_winners</a></li><li><a href="#">category:Commercial-free_television_networks</a></li><li><a href="#">category:Television_production_companies_of_the_United_Kingdom</a></li><li><a href="#">category:BBC_television</a></li></ul>
<a href="#">rdf:type</a>	<ul style="list-style-type: none"><li><a href="#">yago:Commercial-freeTelevisionNetworks</a></li><li><a href="#">yago:TelevisionProductionCompaniesOfTheUnitedKingdom</a></li></ul>



SOME RIGHTS RESERVED

<http://creativecommons.org/licenses/by-nc-sa/2.5>



- DBpedia RDF - Web RDF;  
Human processing (searches) vs machine processing;



# Thank you



[analice@dsi.uminho.pt](mailto:analice@dsi.uminho.pt)



[vidotti@marilia.unesp.br](mailto:vidotti@marilia.unesp.br)



<http://creativecommons.org/licenses/by-nc-sa/2.5>